

Conference Abstract

Past, Present, and Future of Marcescent Mediterranean Forests

Carlos Martins Vila-Viçosa^{‡,§,||}, João Francisco Gonçalves[‡], João Pradinho Honrado^{‡,||}, Rubim Almeida Silva^{||}, Francisco Maria Vazquez[#], Jean Stephan[□], Cristina Pérez García^{«,||}

[‡] CIBIO (Research Center in Biodiversity and Genetic Resources) - InBIO (Research Network in Biodiversity and Evolutionary Biology), University of Porto, Vairão - Porto, Portugal

[§] MHNC-UP - Science and Natural History Museum of Porto University, Biology Department, Faculty of Sciences, University of Porto, Porto, Portugal

[|] Biology Department, Faculty of Sciences, University of Porto, Porto, Portugal

^{||} CIBIO (Research Center in Biodiversity and Genetic Resources) - InBIO (Research Network in Biodiversity and Evolutionary Biology), University of Porto, Porto, Portugal

[#] LA ORDEN-CICYTEX, GUADAJIRA, BADAJOZ, Spain

[□] Lebanese University Faculty of Sciences II Fanar, Fanar, Lebanon

[«] Department of Evolution, Ecology and Behaviour, Institute of Integrative Biology (IIB). University of Liverpool, Liverpool, United Kingdom

Corresponding author: Carlos Martins Vila-Viçosa (cvv@cibio.up.pt)

Received: 12 Jun 2019 | Published: 19 Jun 2019

Citation: Vila-Viçosa C, Gonçalves J, Honrado J, Silva R, Vazquez F, Stephan J, García C (2019) Past, Present, and Future of Marcescent Mediterranean Forests. Biodiversity Information Science and Standards 3: e37195.

<https://doi.org/10.3897/biss.3.37195>

Abstract

Mediterranean forests are unique and one of the most threatened biomes worldwide (Klausmeyer and Shaw 2009). They are distributed through marked ecological gradients that are supported by a wide variety of diverse geology and contrasting bioclimatic conditions.

Marcescence (i.e., the absence of leaf fall abscission; Addicott 1982), is a life-history trait related to contrasting or transitional climatic areas such as those across Eurosiberian and Mediterranean Regions (García-Mijangos et al. 2014). Thus, marcescent forests are ecotones located in the transition between temperate areas with cold winters and mild rainy summers and mediterranean regions with dry and hot summers (Rivas-Martínez et al. 2017).

We aim to provide a global overview of marcescent forests in the Mediterranean basin, a significant ecotone in terms of biogeography and conservation, by exploring the main ecological drivers that have promoted past, current and future changes in the distribution ranges of several oak species.

We used a subset of oak species from the subsection *Galliferae* (*Quercus* L.), to unveil biogeographic relationships and recent or past contact between taxa, thus bringing insights to its evolutionary history and speciation. A database was built with records obtained from extensive fieldwork, herbaria review and online resources (e.g., Global Biodiversity Information Facility ([GBIF](#)), scrutinized by taxonomic experts. We used downscaled climate data to obtain potential distribution of each species through an ensemble-modelling framework (biomod2 - R package, Araújo and New 2007, Thuiller et al. 2009), across different past (Last Glacial Maximum and Middle Holocene), present and future scenarios (2050 and 2080 Hijmans et al. 2005; Representative Concentration Pathway (RCP) 4.5 IPCC 2013).

Results provide new insights to advance our current understanding of the biogeographic trajectories of transiently co-occurring oak species, at the boundary of two major biomes and biogeographic regions in Southern Europe and North Africa.

Furthermore, we highlight the importance of these forests for biodiversity conservation, not only as refuge of relict and narrow endemic species, but particularly for understanding white oak biogeography and evolution in Europe, anticipating future shifts driven by anthropogenic climate change.

Keywords

climate change, forecast, habitat-suitability models, hindcast, oak forests, *Quercus*, species distribution models

Presenting author

Carlos Vila-Viçosa

Presented at

Biodiversity_Next 2019

Funding program

Doctoral Programme in Biodiversity, Genetics and Evolution (BIODIV), University of Porto (UP), Portugal

Grant title

PD/BD/52607/2014

Conflicts of interest

No conflict of interest was reported by the authors.

References

- Addicott FT (1982) *Abscission*. University of California Press, Berkeley, Los Angeles.
- Araújo MB, New M (2007) Ensemble forecasting of species distributions. *Trends in Ecology & Evolution* 22 (1): 42-47. <https://doi.org/10.1016/j.tree.2006.09.010>
- García-Mijangos I, Campos JA, Biurrun I, Herrera M, Loidi J (2014) Marcescent forests of the Iberian Peninsula: Floristic and climatic haracterization. *Geobotany Studies* 119-138. https://doi.org/10.1007/978-3-319-01261-2_6
- Hijmans RJ, Cameron SE, Parra JL, Jones PG, Jarvis A (2005) Very high resolution interpolated climate surfaces for global land areas. *International Journal of Climatology* 25 (15): 1965-1978. <https://doi.org/10.1002/joc.1276>
- IPCC (2013) Fifth Assessment Report (AR5). http://www.ipcc-data.org/sim/gcm_monthly/AR5/index.html. Accessed on: 2019-4-30.
- Klausmeyer KR, Shaw MR (2009) Climate change, habitat loss, protected areas and the climate adaptation potential of species in Mediterranean ecosystems worldwide. *PLoS One* 4 (7): e6392. <https://doi.org/10.1371/journal.pone.0006392>
- Rivas-Martínez S, Penas A, del Río S, González T, Rivas-Sáenz S (2017) Bioclimatology of the Iberian Peninsula and the Balearic Islands. In: Loidi J (Ed.) *The vegetation of the Iberian Peninsula*. 1, 12. Springer International Publishing, 29-80 pp. [ISBN 978-3-319-54782-4]. <https://doi.org/10.1007/978-3-319-54784-8>
- Thuiller W, Lafourcade B, Engler R, Araújo MB (2009) BIOMOD—a platform for ensemble forecasting of species distributions. *Ecography* 32: 369-373. <https://doi.org/10.1111/j.1600-0587.2008.05742.x>